The Association Between Applying Sodium Fluoride Mouthwash and Decayed Missed Filled Teeth (DMFT) Index in Elementary…

Article *in* World Applied Sciences Journal · January 2013

DOI: 10.5829/idosi.wasj.2013.24.02.984

2 authors:

Abdolmajid Fadaei
Shahrekord University of Medical Sciences
9 PUBLICATIONS **28** CITATIONS
SEE PROFILE

Masoud Amiri
Deaprtment of Epidemiology and Biostatistics, …
93 PUBLICATIONS **441** CITATIONS
SEE PROFILE

World Applied Sciences Journal 24 (2): 140-145, 2013
ISSN 1818-4952

DOI: 10.5829/idosi.wasj.2013.24.02.984

The Association Between Applying Sodium Fluoride Mouthwash and Decayed Missed Filled Teeth (DMFT) Index in Elementary Students of Charharmahal and Bakhtiari Province, Iran

[1]Abdolmajid Fadaei and [2]Masoud Amiri

[1]Department of Environmental Health Engineering, School of Public Health,
Shahrekord University of Medical Sciences, Shahrekord, Iran
[2]Social Health Determinants Research Center,
Shahrekrod University of Medical Sciences, Shahrekord, Iran

Abstract: Regular use of fluoride makes the teeth stronger against cavities. In this regard, using sodium fluoride mouthwash is taken as a countrywide program for elementary students so as to protect their teeth against caries. This study aimed to evaluate the correlation between use of sodium fluoride mouthwash by elementary students in Charharmahal and Bakhtiari province, Iran, and decayed missed filled teeth (DMFT) index. In the present study, 472 students were selected based on multi-stage cluster and random sampling. Then, the students were monitored for the DMFT index, Fluorosis, and gingivitis. Additionally, the data were compared using Chi-square test. The results showed that the average DMFT (for permanent teeth) and dmft (for milky teeth) for nine- and twelve-year-old students, who lived in urban areas were 2.66± 0.9 and 2.64±0.1, respectively. In addition, the corresponding averages for the students in the same age groups who lived in rural areas were 2.80±0.1 and 2.88±0.09, respectively ($p < 0.05$). According to the results, it can be conceived that using sodium fluoride mouthwash could not meet the program's expectations of enhancing oral health. Hence, the authors suggest that it would be more beneficial if children started to use mouthwash from kindergarten.

Key words: Decay missed filled teeth index · Mouthwash · Sodium fluoride

INTRODUCTION

Recently, cavities and gingivitis have become a common oral problem in the country [1]. These problems as well as oral health are strongly related to food consumption patterns, culture, and the level of knowledge among people living in the country [2]. Therefore, the project of uniting oral health with primary health care, with the purpose of improving the primary oral health services in terms of quantity and quality was proposed and accepted to be applied for elementary school children at 2006 by the cooperation of the Ministry of Health and Medical Education and the Ministry of Education. Fluoride is one of the elements which can be applied to prevent caries [3]. This element can be found in soil, minerals, and water resources [4]. In addition, drinking water fluoridation, beverages carrying fluoride, salt, sugar, mouthwash, toothpaste, tea, and fluoride gel are advised to be regularly used in order to compensate for the lack of fluoride in human's body [5]. According to the oral health program, sodium fluoride mouthwash 0.2% was utilized for students. Moreover, each student was given a bottle of the mouthwash and taught to gargle one teaspoon of the solution for one minute in his/her mouth every day. It is noteworthy that each bottle was enough for one year if the students acted according the program.

World Health Organization (WHO) has proposed the DMFT method, which is a simple, time-saving, applicable method in dental clinics in order to evaluate such administrated interventions. In definitional terms, DMFT is the ratio of the average of all people's teeth in a community which have cavities, are filled, or removed to the number of people. The important goals of WHO which are planned to be met by 2010 are to decrease the DMFT

Corresponding Author: Abdolmajid Fadaei, Department of Environmental Health Engineering, School of Public Health, Shahrekord University of Medical Sciences, Shahrekord, Iran. P.O. Box: 8813834435, Tel: +98-381-3330299, Fax: +98-381-3334678, E-mail: ali2fadae@yahoo.com.

index of those who are less than twelve years old to lower than one, 90% of children who are 5 to 6 years old should have complete oral health, and also 100% oral health for those who are 18 years old [6]. Based on the statistical reports in the country, every three-year-old child has almost two decayed tooth. Regarding this report, it should be mentioned that milk teeth not only affect chewing, digestive system, beauty, and talking in childhood, but they also play an important role in the health of permanent teeth. Hence, the cavities of milk teeth are as important as permanent teeth cavities.

The average of DMFT index in Iran is 1.2- 2.4. Additionally, this amount is reported to be 2.42- 2.028 and 1.98- 2.98 for the age groups of 12 to 15 in Khorasan and Babol provinces of Iran [7].

In a study conducted by Ripa , on the use of sodium fluoride mouthwash by 610 students in two regions for twenty months, it was reported that mouthwash had no significant effect; the reason was mentioned to be the lack of cooperation among the study group [8]. In another study which was conducted on nine-year-old children for thirty months to evaluate the effects of using mouthwash, it was observed that use mouthwash had no significant effect on preventing the caries in the study group. As it is shared by the experts in this field, improving the bad habits in life and food baskets of the families could significantly enhance the oral health of the community. In addition, nutritional advice, toothpaste containing fluoride and mouthwash (Fissure Sealant) are proposed to be the best ways of preventing the caries [9, 10].

According to the countrywide program of using sodium fluoride mouthwash since 2006, this study was aimed to evaluate the effect of using mouthwash by nine- and twelve-year-old children on the DMFT index. The result of this study shows whether applying the mouthwash was effective in preventing the children from having caries or changes the way by which the children take their acceptable level of fluoride.

MATERIALS AND METHODS

Province Charharmahal and Bakhtiari is small province in southeast Iran, with a population of 857,910 people (2011) and an area of 16,403 km^2.This is a descriptive-analytical study which was conducted on the study group of nine- and twelve-year-old children who were living in urban and countryside areas of Charharmahal and Bakhtiari province in 2010. The study group was selected based on multi-stage cluster and random sampling. In total, 472 students comprising 215 nine-year-old and 257 twelve-year-old school children were selected to be studied. The data collection was performed in two stages; first, filling the questionnaire and then the observations of dentists. It is noteworthy that the questionnaire comprised demographical questions (i. e. age, sex, origin, parental level of educations, etc.), the way that the mouthwash was used, brushing, flossing, the everyday amount of consuming sugar, and the rate of visiting dentists. DMFT and dmft were used for the permanent teeth and milky teeth, respectively. In addition, Fluorosis and gingivitis were evaluated among the study group. In order to determine the community fluorosis index (CFI), the Dean Index was applied, based on WHO guidelines [11]. In this regard, the scores of 0.5, 1, 2, 3, and 4 were allocated to fluorosis conditions of normal, dubious, very poor, poor, medium, and severe, respectively. The CFI is determined by applying the following formula:

$$CFI = N * Q / TP$$

which, N shows the number of patients, Q indicates the quantitative value of fluorosis, and TP stands for the total number of visited people.

The two age groups of nine and twelve were considered to be included in the study group mainly because their statistical information in 2006 was available to be compared with the current conditions in 2010, which fortunately overlap with our aims to determine the effects of the program on the students . Furthermore, it should be mentioned that the severity of cavity in permanent teeth could be effectively evaluated in these ages. By applying the results achieved by chemistry lab at Shahrekord medical university, the needed data regarding the concentration of fluoride was collected. Finally, the collected data from questionnaires, visits, and statistical information in 2006 were used as input to be calculated based on the chi-square test.

RESULTS

Table 1 shows, the average DMFT and dmft of nine-year-old students with 95% certainty were respectively 0.77 ± 0.063 and 5 ± 0.059. 12.5% of milky teeth and 65.99% of permanent teeth of the study group's members were caries-free. Comparison of the results with the available data from 2006 shows a significant difference in the index. In other words, it shows that the program of applying mouthwash was not able to decrease the DMFT of the students. In addition, the DMFT was annually increased

Table 1: The average DMFT of students before and after programs sodium fluoride mouthwash

	9 Age		12 Age	
Year	Milky teeth Mean (SD)	Permanent teeth Mean (SD)	Milky teeth Mean (SD)	Permanent teeth Mean (SD)
2006(before)	3.5(0.0.28)	0.63(0.11)	1.8(0. 19)	0.6 (0.11)
2010(after)	5(0.59)	077(0.06)	2.41(0.64)	1.26(0.57)

P value<0.05

Table 2: The percentage DMFT of students before and after programs sodium fluoride mouthwash

	9 Age								12 Age							
	Milky teeth%				Permanent teeth%				Milky teeth%				Permanent teeth%			
Year	D	M	F	Without caries	D	M	F	Without caries	D	M	F	Without caries	D	M	F	Without caries
2006	82.4	14.3	2.2	10.3	82.6	4.3	10.9	63.2	85.4	11.2	3.4	44.5	81.6	12.5	5.9	87.5
2010	97.9	1.1	1	12.5	94.58	0.6	4.82	65.99	98.39	0.97	0.64	5.45	90.15	4.4	21.69	86.31

Table 3: The average DMFT of students nine and twelve years old

Sex	Milky teeth Mean (SD)	Permanent teeth Mean (SD)
Boys(n=225)	3.16(0. 08)	1.23(0.06)
Girls(n=247)	3.1(0.04)	1.76(0.05)

P value<0.05

Table 4: The percentage DMFT of students nine and twelve years old

	Milky teeth%				Permanent teeth%			
Sex	D	M	F	Without caries	D	M	F	Without caries
Boys	86.93	0.29	12.78	15.63	95.32	0.36	4.32	44.62
Girls	87.09	0.26	12.65	13.77	95.18	0.23	4.59	44.86

Table 5: Fluoride concentration in various regions Charharmahal and Bakhtiari province

Region	Shahrekord,	Farokhshar	Taghanak	Hafshejan,	Kharaji	Dezak,	Harchegan	Hure	Vardenjan
Fluoride concentration (mg/L)n=36	0.14	0.18	0.25	0.26	0.12	0.10	0.11	0.2	0.11

by 0.17%. Furthermore, the average dmft which was achieved significantly differs with its correspondence value in 2006 ($p<0.05$), which can be seen in Tables 1 and 2. The dmft for nine-year-old students was increased from 3.5% in 2006 to 5% in 2010. In addition, the average DMFT and dmft for the twelve-year-old students were 1.26±0.057 and 2.41±0.064, respectively ($p<0.05$), which is shown in Table 1. Based on the results, the condition of nine-year-old students in terms of fluorosis and gingivitis before and after starting the program could not be significantly associated. It is noteworthy that CFI of the students before and after starting the program were 4.1 and 5.1, respectively. Besides, a significant correlation could not be found between gingivitis and gingivitis along with mass teeth before and after starting the program. In addition, the oral health conditions of the twelve-year-old students in terms of fluorosis and gingivitis showed that there is no significant difference between such oral problems before and after the program ($p>0.05$). The total fluorosis recorded before and also after the program were 4.03 and 8.2, respectively. The achieved CFI among the nine- and twelve-year-old students were 0.1 and 0.59, respectively.

The comparative average of DMFT and dmft of nine- and twelve-year-old male students were 1.23±0.069 and 3.16±0.08, respectively, the result of which is shown in Table 3 In addition, the corresponding averages for nine- and twelve-year-old female students were 1.76±0.05 and 3.1 ± 0.04, respectively. Based on the results, 44.62% of permanent teeth and 15.63% of milky teeth of male students were caries-free. Furthermore, the permanent and milky teeth of female students were respectively 44.86% and 13.77% caries free, the result of which is shown in Table 4. Additionally, the average DMFT and dmft for nine- and twelve-year-old male students from the city regions were 2.66±0.9 and 2.64±0.1, respectively. The corresponding averages for the same age group from the rural regions were respectively 2.8±0.1 and 2.88±0.09 ($p< 0.05$).

In 2010, the fluoride concentration in drinking water from urban and countryside regions, which is shown in Table 5.

DISCUSSION

Based on the results, applying sodium fluoride mouthwash could not decrease the DMFT of nine-year-old students; ironically, for these students, the index value annually increased by 0.17. In addition, the students' dmft increased by 1.5%, compared with their dmft in 2006, which indicates that dmft increased annually by 0.17. Moreover, this trend could be found among the twelve-year-old students. In fact, their DMFT increased from 0.6 in 2006 to 1.26 in 2010. Besides, their dmft increased from 1.8 to 2.4 during the same time period. The data regarding the CFI of nine-year-old students showed that there is no significant difference between the CFI of 0.06 in 2006 and the CFI of 0.059 in 2010. As a matter of fact, this age group did not suffer from fluorosis. It should be mentioned that the CFI for the twelve-year-old students before and after starting the program were 0.05 and 0.01, respectively.

As it can be conceived from the results, sodium fluoride mouthwash is not capable of reducing caries from milky and permanent teeth. Hence, the authors are not in agreement with Ministry of Health about the benefits of the mouthwash, which is believed to be an annual caries decrease of 25%. The reasons why the program fails to reach its aim could be the improper monitoring rendered by the school teachers and also the health care centers on the way in which the students should use the mouthwash. In addition, there are other reasons the program failure, including food habits (i. e. consuming unacceptable amount of sugar, chocolate, potato chips, and nuts at schools), having poor access to dental cares, and also socio-economic problems. It is noteworthy that the program could enhance the awareness of such issues among the students, but still the DMFT index would not likely decrease. In a study conducted on nine-year-old students in Shiraz, Iran, it was indicated that the average DMFT and dmft of the students did not decrease after five years of using the mouthwash. Furthermore, in another study conducted by Holve on American and Indian children, the results showed that there is a correlation between the number of times the mouthwash is used and the correct way of using it. In other words, they reported that there is not a significant difference in DMFT between the children who were using the mouthwash one, two, or three times a day and those who did not use the mouthwash at all. In fact, this can also be accounted as another reason why the program could not meet its goal [12] . In addition, Moberg et al., which conducted a study on three-year-old children and teenagers between 13 and 16, reported that sodium fluoride mouthwash could not prevent caries in their study group. Based on their results, the best way to prevent such oral problems is using tooth paste containing fluoride [13]. Based on a study conducted by Jones et al., who applied water fluoridation in California, USA, salt enrichment in Jamaica, milk enrichment in Chili, and tooth paste enrichment with fluoride to add fluoride into the daily program of the people, hybrid methods, which is suggested by them, can be more beneficial than using just one method 14]. In addition, Hardman et al., who studied the effects of mouthwash on 334 6-to-8-year-old students from Manchester, England, mentioned that relying only on mouthwash could not prevent among the studied children [15]. Rodgers suggested that if the fluoride concentration in drinking water is between 0.7 and 1.2, brushing teeth with fluoridated tooth paste two times a day removes the necessity of applying the mouthwash [16]. Considering the results reported by previous studies and also the present study, it is clear that applying only mouthwash to prevent caries is not acceptable. In fact, complementary methods, including Fissure Sealant, enrichment, and changing food habits should also be considered. The DMFT of the nine-year-old students from Shahrekord was 5.77; based on WHO guidelines for determining DMFT at societies, they are classified as the high caries societies (4.5- 6.5). In addition, the twelve-year-old students with 3.67 DMFT are in the same class [17].

The average DMFT of nine- and twelve-year-old students who were from the urban regions was 5.3, which is higher than 4.96 DMFT of the students from rural regions. This can be due to the fact that those who are living in rural areas consume more dairy products and less junk food. It also indicates that the program was more successful in rural areas, compared with the urban regions. Considering the failure of mouthwash program to reduce caries, it can be derived that if the authorities want to effectively approach this issue, the target group should be selected from those who are more at risk of developing caries. It should be mentioned that finding the target group among the population needs careful studies. Furthermore, considering any program regarding the mouthwash should be based on risk assessment (i. e. poor socio-economic conditions, inaccessibility to dental services, immigration, etc.); besides, the level of caries before and after starting the program is the best criteria in assessing the risks.

Moreover, there are also another ways by which people could efficiently protect their teeth, including the use of Fissure sealant alone or along with mouthwash, or using tooth paste and mouthwash. In addition, in case the mouthwash could not meet the expectations, fluoridation of schools' drinking water, enriching milk with fluoride at school, and enriching salt with fluoride can also be helpful in reducing caries. The F concentration of the type waters in the present study was below standard 1.5 mg/L [18], so the availability of other sources of fluoride also needs to be considered and taken into account in the planning of public health dentistry programs. Mahvi et al. have reported a mean fluoride concentration of drinking water in Behshahr City, Iran of 0.25 ± 0.06 mg/L which was less than the standard range [19].

CONCLUSION

Considering the results that show no improvement in reducing caries and increasing oral health by using of sodium fluoride mouthwash for eight years, careful monitoring of the program and also approaching the drinking water fluoridation, enriching milk and/or flour with fluoride, and adjusting food habits should be taken into account. Finally, periodic visits of students at school or private clinics should be increased.

ACKNOWLEDGEMENTS

This research has been supported by Shahrekord University of Medical Sciences.

REFERENCES

1. Featherstone, J.D., 2008. Dental caries: a dynamic disease process. Australian Dental Journal, 53(3): 286-291.
2. Pessan, J.P., N.S. Al-Ibrahim, M.A. Buzalaf and K.J. Toumba, 2008. Slow release fluoride devices: a literature review. Journal of Applied Oral Science, 16(4): 238-246.
3. Wang, Z., X. Yang, S. Yang, G. Ren, M. Ferreri, Y. Su. *et al*., 2011. Sodium fluoride suppress proliferation and induce apoptosis through decreased insulin-like growth factor-I expression and oxidative stress in primary cultured mouse osteoblasts. Archives of Toxicology, 85(11): 1407-1417.
4. Jacinto-Aleman, L.F., J.C. Herna´ndez-Guerrero, C. Trejo-Solı´s, M.D. Jime´nez-Farfa´n and A.M. Ferna´ndez-Presas, 2010. In vitro effect of sodium fluoride on antioxidative enzymes and apoptosis during murine odontogenesis. Journal of Oral Pathology and Medicine, 39(9): 709-714.
5. Vogel, G.L., 2011. Oral fluoride reservoirs and the prevention of dental caries. Monographs in Oral Science, 22: 146-157.
6. World Health organization. Goals for oral health in the year 2010, 1982. British Dental Journal, 152(1): 21-22.
7. Mahyaei, P., 2001. Evaluation of the DMFT in 12-year old students in Babol thesis of dentistry. Tehran Islamic Azad University, Iran, pp: 40-45.
8. Ripa, L.W., 1991 .A critique of topical fluoride methods (dentifrices, mouthrinses, operator, and selfapplied gels) in an era of decreased caries and increased fluorosis prevalence. Journal Public Health Dentistry, 51(1): 23-41.
9. Pakshir, H.R. and N. Babanouri, 2004. Evaluation of the effectiveness of school- based fluoride mouth rinse program on dental caries reduction in 9 year old students in Shiraz. Shiraz University of Medical Sciences Journal Dentistry, 1&2(9): 16-25.
10. Azarpazhooh, A. and P.A. Main, 2008. Fluoride varnish in the prevention of dental caries in children and adolescents: a systematic review. Journal Canadian Dental Association, 74(1): 73-79.
11. De Carvalho, C.A., C.A. Zanlorenzi Nicodemo, D.C. Ferreira Mercadante, F.S. de Carvalho, M.A. Rabelo Buzalaf and S.H. de Carvalho Sales-Peres, 2013. Dental fluorosis in the primary dentition and intake of manufactured soy-based foods with fluoride Clinical Nutrition, 32(3): 432-437.
12. Holve, S., 2008. An observational study of the association of fluoride varnish applied during well child visits and the prevention of early childhood caries in American Indian children. Maternal and Child Health Journal, 12(Supple 1): 64-67.
13. Moberg Skold, U., D. Birkhed, E. Borg and L.G. Petersson, 2005. Approximal caries development in adolescents with low to moderate caries risk after different 3-year school-based supervisedfluoride mouth rinsing programmes. Caries Research, 39(6): 529-535.
14. Jones, S.H., B.A. Burt, P.E. Petersen and M.A. Lennon, 2005. The effective use of fluorides in public health. Bulletin of the World Health Organization, 83(9): 670-676.

15. Hardman, M.C., G.M. Davies, J.T. Duxbury and R.M. Davies, 2007. A cluster randomised controlled trial to evaluate the effectiveness of fluoride varnish as a public health measure to reduce caries in children. Caries Research, 41(5): 371-376.
16. Rodgers, J., 2008. Fluoride varnish as a public health measure to reduce caries. Evidence Based Dental, 9(1): 9-10.
17. Daneshkazemi, A.R. and A. Davari, 2005. Assessment of DMFT and enamel hypoplasia Among junior high school children in Iran. Journal of Contemporary Dental Practice, 6(4): 85-92.
18. Guler, C., 2007. Evaluation of maximum contaminant levels in Turkish bottled drinking waters utilizing parameters reported on manufacturer's labeling and government-issued production licences .Journal of Food Composition and Analysis, 20(3-4): 262-272.
19. Mahvi, A.H., M.A. Zazoli, M. Younecian, B. Nicpour and A. Babapour, 2006. Survey of fluoride concentration in drinking water sources and prevalence of DMFT in the 12 years old students in Behshahr city. Journal of Medical Sciences, 6(4): 658-661.